Research Article

INTERNATIONAL RESEARCH JOURNAL OF PHARMACY

www.irjponline.com

ISSN 2230-8407 [LINKING]

MODIFIED LATERAL THORACOLUMBAR INTERFACIAL PLANE BLOCK WITH GA AND CLASSICAL MEDIAL INTERFACIAL PLANE BLOCK

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How to cite: Karbhari A, Verma AK. Modified lateral thoracolumbar interfacial plane block with GA and classical medial interfacial plane block. International Research Journal of Pharmacy. 2022;13:5:48-52.

DOI: 10.7897/2230-8407.13031881

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ABSTRACT

Background: Patients having lumbar disc operations frequently undergo thoracolumbar interfacial plane block. Over time, it has undergone modifications. However, there is a dearth of information about its modification in the Indian setting.

Aim: The purpose of this study was to compare the effects of modified lateral thoracolumbar interfacial plane block with just GA and traditional medial interfacial plane block in patients having lumbar disc operations.

Methods: 200 participants between the ages of 18 and 70 were randomly assigned to one of three groups for the study. Group C received only GA using multimodal analgesia, Group mTLIP received modified TLIP block with 20 mL of 0.25% ropivacaine with GA, and Group cTLIP received conventional TLIP block with 20 mL of 0.25% ropivacaine with GA.

Results: Group mTLIP and cTLIP consumed considerably more opioids overall during the perioperative period than group C ($p<0.001$). Opioid use and pain, however, were similar in cTLIP and mTLIP ($p=0.767$). Group C experienced much less pain ($p=0.001$). 15.2% of patients from the cTLIP and mTLIP groups and 100% of subjects in Group C required rescue analgesia. 61.8% of Group C participants had nausea and vomiting during the first 24 hours, compared to none of the cTLIP and mTLIP groups, which was significant ($p=0.001$).

Conclusion: The current investigation comes to the conclusion that the modified TLIP block's analgesic efficacy was not better than that of the traditional TLIP block. For lumbar disc operations, both methods have produced the same intraoperative and postoperative analgesia.

Keywords: thoracolumbar interfascial plane block, lumbar disc surgery, analgesia, and peri-operative analgesia

INTRODUCTION

Typically, spinal operations are performed to stabilize the spine's vertebrae and discs. The subcutaneous tissues, ligaments, and bone must usually be significantly moved during the surgery, which can cause excruciating agony afterward. Most of the time, severe pain can be documented for at least three days.1 The amount of postoperative discomfort experienced is directly correlated with the number of vertebrae involved. These patients' previous pain and prolonged use of opioids and analgesics make them more vulnerable to pain, which makes pain management even more difficult. Effective pain management shortens hospital stays and aids in early mobilization.[2]

Postoperative pain following lumbar disc operations is managed using a variety of analgesic approaches. The dorsal rami of the thoracolumbar nerves as they pass through paraspinal muscles were blocked using TLIP (thoracolumbar interfascial plane) block. The iliocostalis, longissimus, and multifidus are the three muscles that make up the erector spinae muscle. An LA (local anaesthetic) is administered to the interfascial plane between the multifidus and longissimus muscles at the level of the L3 vertebra under ultrasound guidance during a medial or classic TLIP block.[3]

On the other hand, LA is administered in the interfascial plane between the iliocostalis and longissimus muscles in lateral/modified TLIP. This is easy to do because it has better plane identification and is distant from the midline.[4]

The purpose of this study was to compare the perioperative opioid consumption of subjects undergoing spinal disc surgeries using two approaches: TLIP block as lateral vs. classical with general anaesthesia (GA) and no block (only GA method) using intravenous (IV) multimodal analgesia.

MATERIALS AND METHODS

The goal of the current comparative randomized parallel design study was to compare the perioperative opioid consumption of subjects undergoing spinal disc surgeries using two approaches: TLIP block as lateral vs. classical with general anaesthesia (GA) and no block (only GA method) using intravenous (IV) multimodal analgesia. Prior to their involvement in the study, all subjects gave their written and verbal informed consent. 200 participants with ASA (American Society of Anesthesiologists) status I and II, ages 18 to 70, who had lumbar disc operations throughout the trial's designated time frame were included in the study.

Women who were pregnant or nursing, coagulopathy, systemic infection, local infection (administration site), contraindications to regional technique, opioid tolerance history, body mass index (BMI) greater than 35 kg/m2, scoliosis correction, major lumbar spine procedures (e.g., removal of large tumors, lumbar spine surgery), and subjects who were unwilling to participate were excluded from the study.

Every participant received a standard pre-anesthetic evaluation and instruction on how to report pain using the numerical rating scale (NRS), patient-controlled analgesia (PCA), and how to use the PCA pump if pain was experienced. Group cTLIP, Group mTLIP, or Group C were the three groups into which all subjects were assigned. Prior to the induction of anesthesia, baseline vitals were recorded in the operating room, including electrocardiogram (ECG), non-invasive blood pressure (NIBP), pulse oximeter (SpO2), neuromuscular monitoring (NMT), and hemodynamic parameters. A cannula was used to secure IV (intravenous) access, and the injection of a salt solution was carried out.

NMT was started after anesthesia induction, which was accomplished with 1.5-2 µg/kg IV fentanyl, 2-4% isoflurane, 100% oxygen, and 2-2.5 mg/kg IV propofol while maintaining a minimum alveolar concentration (MAC) of 0.8–1.2. 100% oxygen was utilized for preoxygenation prior to anesthesia induction. When the TOF (train of four) count was zero, 0.5 mg/kg IV atracurium was utilized for tracheal intubation. An endotracheal tube (ETT) of the proper size was used to secure the airway. Foley's catheter was inserted and the individuals were put in the supine position after the ETT was fixed. 20mL of 0.25% Ropivacaine and GA were used to provide classical TLIP block to 66 participants in the cTLIP group.

Group C/control group received only GA without block, while 66 individuals from the mTLIP group received a modified lateral TLIP block with 20mL of 0.25% Ropivacaine and GA. 150 mg of ranitidine and 0.25 mg of oral alprazolam were administered as premedication the night before and early the morning of the procedure. After identifying L3 in the cTLIP group, a curvilinear probe was positioned transversely at the midline level of the L3 vertebra and adjusted to a suitable depth of 3–8 cm on the USG screen.

It was placed in the plane laterally to medially, at an angle of about 30° to the skin, and advanced toward the multifidus muscle through the belly of the longissimus muscle after the corresponding spinous process and interspinal muscles—the multifidus, longissimus, and iliocostalis from medial to lateral—were identified. 15 mL of 0.25% ropivacaine was injected with intermittent negative aspiration once the needle tip had reached the longissimus/multifidus interfascial muscle plane near the superior articular process. The remaining 5 mL of 0.25% ropivacaine was then injected beneath the ipsilateral thoracolumbar fascia, and the process was repeated on the contralateral side.

Following L3 identification in the mTLIP group, the needle was inserted at a 30° angle to the skin from the lateral to the medial direction and advanced towards the longissimus muscle. Once the needle reached the interface between the longissimus and iliocostalis muscle, 15ml of 0.25% ropivacaine was administered intermittently to confirm negative aspiration.

The remaining 5ml was administered beneath the ipsilateral thoracolumbar fascia, and the same process was repeated on the other side. Two groups had their spread verified by ultrasonography right after administration, while group C received GA only intravenously.

Intraoperative neuromuscular blockade was maintained with intermittent boluses of IV atracurium 0.2 mg/kg guided by NMT (TOF count zero), while 1-2% isoflurane was administered for anesthesia maintenance in oxygen and 50:50 air to obtain the goal MAC of 0.8-1.2. 0.5–1.0 µg/kg IV fentanyl was given when the heart rate or MAP (mean arterial pressure)

rose more than 20% from the baseline. Ondansetron 4 mg (IV) and 1 mg/kg of paracetamol were administered 30 minutes prior to the conclusion of the procedure.

Glycopyrrolate (7–10 µg/kg) and IV neostigmine (50–70 µg/kg) were administered to reverse residual neuromuscular blockade at the conclusion of the procedure. After all, extubation requirements were satisfied, each individual was transferred to the post-anesthesia care unit (PACU).

At 0, 1-, 3-, 6-, and 24-hours following admission to the PACU, NRS scores (both at rest and during movement) were noted. For no pain, mild pain, moderate pain, and severe pain, the NRS showed ratings of 0, 1, 3, 4, 7, and >7, respectively. A fentanyl-based IV PCA pump that delivered 20 µg of fentanyl at each button press and lockout of 15 minutes, with a maximum dose limit of 80 µg/h and 320 µg in 4 hours, was used in NRS >3 cases after a bolus of fentanyl 1.0 µg/kg. The initial analgesic need during the first 24 hours was noted as the timing of the first bolus dose. For 24 hours following surgery, all individuals received intravenous (15 mg/kg) paracetamol every 6 hours.

During the first 24 hours, the number of PONV (postoperative nausea and vomiting) episodes was noted. PONV was graded as 0, 1, 2, and 3, which corresponded to no nausea or vomiting, nausea but no vomiting, vomiting once within 30 minutes, and vomiting twice or more within 30 minutes. IV ondansetron 4 mg was given to those whose scores were more than 1. IV metoclopramide 150 µg/kg was given as a rescue antiemetic if there was no improvement. In order to maintain SpO2 of >94% and RR of >10/min, standard hemodynamic measures, such as respiratory rate (RR) and SpO2, were also evaluated for the first 24 hours after surgery.

When a subject's respiration rate was 70 mmHg and they were experiencing pruritus, 0.25–1 µg/kg of intravenous naloxone was given. Total perioperative (intraoperative and postoperative) opioid use within the first 24 hours was the study's main end measure. The incidence of drug-related complications, postoperative opioid consumption within the first 24 hours following surgery, time to first analgesic need following surgery, NRS score upon arrival in the PACU, and hemodynamic response to surgical stimulus during the procedure were evaluated as secondary outcomes in the two study groups. Fisher's exact test, Mann-Whitney U test, Chi-square test, Student t-test, ANOVA (analysis of variance), and SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk, NY, USA) were used to statistically analyze the collected data. The findings were presented as frequency, percentages, mean, and standard deviation. A p-value of less than 0.05 was taken into account.

RESULTS

The goal of the current comparative randomized parallel design study was to compare the perioperative opioid consumption of subjects undergoing spinal disc surgeries using two approaches: TLIP block as lateral vs. classical with general anesthesia (GA) and no block (only GA method) using intravenous (IV) multimodal analgesia.

200 participants with ASA (American Society of Anesthesiologists) status I and II, ages 18 to 70, who had lumbar disc operations throughout the trial's designated time frame were included in the study. The study participants in Groups mTLIP, cTLIP, and C had respective mean ages of 42.62±12.02, 41.01±11.69, and 40.91±12.21 years. In mTLIP, there were 38 males and 28 females; in cTLIP, there were 34 males and 32 females; and in the C group, there were 30 males and 38 females. In the mTLIP, cTLIP, and C groups, the distribution of weight, BMI, and ASA status was statistically similar (Table 1).

Compared to Groups mTLIP and cTLIP, Group C's intraoperative opioid use was significantly higher ($P < 0.001$). The cTLIP and mTLIP groups used opioids at comparable rates ($p=0.101$). Group C consumed considerably more opioids in the first 24 hours after surgery than the cTLIP and mTLIP groups ($p>0.05$). Additionally, the cTLIP and mTLIP groups had similar postoperative opioid intake in the first 24 hours ($p=0.754$). Group C consumed considerably more fentanyl overall during the perioperative period than did the mTLIP and cTLIP groups ($p=0.002$). Nonetheless, at $p=0.765$, it was similar in the mTLIP and cTLIP groups (Table 2).

According to the study's findings, only 15.2% of participants in the mTLIP and cTLIP groups required boluses of rescue analgesics, while all participants in Group C required rescue analgesia. The mTLIP and cTLIP groups had a considerably longer time to first analgesic request ($p<0.001$) than Group C. However, there was no significant difference in the time to the first analgesic request between the mTLIP and cTLIP groups ($p=0.96$). NRS was considerably lower in the mTLIP and cTLIP groups upon PACU arrival compared to a control group ($p=0.001$). However, with $p=0.653$, NRS was similar in the mTLIP and cTLIP groups (Table 2).

61.8% (n=42) of patients from group C had nausea or vomiting, with a p-value of 0.001, whereas no subjects from the mTLIP or cTLIP groups reported any PONV within the first 24 hours. PONV scores of 1, 2, and 3 were reported in 18, 22, and 2 of these group C individuals, respectively. Both participants with PONV 3 required the second rescue antiemetic,

while those with a PONV score of two required the first. Constipation, respiratory depression, and/or pruritus were among the opioid-related adverse effects that none of the subjects experienced (Table 2).

DISCUSSION

200 participants with ASA (American Society of Anesthesiologists) status I and II, ages 18 to 70, who had lumbar disc operations throughout the trial's designated time frame were included in the study. The study participants in Groups mTLIP, cTLIP, and C had respective mean ages of 42.62±12.02, 41.01±11.69, and 40.91±12.21 years.

In mTLIP, there were 38 males and 28 females; in cTLIP, there were 34 males and 32 females; and in the C group, there were 30 males and 38 females. In the mTLIP, cTLIP, and C groups, the distribution of weight, BMI, and ASA status was statistically similar. These results were similar to those of earlier studies by Eltaher E et al. (5 in 2021) and Ozmen O et al. (6 in 2019), in which the authors evaluated participants undergoing lumbar disc operations using demographic data similar to the current study.

According to the study's findings, Group C consumed considerably more intraoperative opioids than Groups mTLIP and cTLIP ($P < 0.001$). The cTLIP and mTLIP groups used opioids at comparable rates ($p=0.101$).

Group C consumed considerably more opioids in the first 24 hours after surgery than the cTLIP and mTLIP groups ($p>0.05$). Additionally, the cTLIP and mTLIP groups had similar postoperative opioid intake in the first 24 hours ($p=0.754$). Group C consumed considerably more fentanyl overall during the perioperative period than did the mTLIP and cTLIP groups ($p=0.002$). Nonetheless, at $p=0.765$, it was similar in the mTLIP and cTLIP groups.

These findings aligned with those of Çiftçi B et al7 in 2020 and Hu Z et al8 in 2021, whose research found that intraoperative and postoperative opioid use following lumbar spine procedures were similar to the current study's findings.

Only 15.2% of individuals in the mTLIP and cTLIP groups required boluses of rescue analgesics, while all subjects in Group C required rescue analgesia. The mTLIP and cTLIP groups had a considerably longer time to first analgesic request ($p<0.001$) than Group C.

However, there was no significant difference in the time to the first analgesic request between the mTLIP and cTLIP groups ($p=0.96$). NRS was considerably lower in the mTLIP and cTLIP groups upon PACU arrival compared to a control group ($p=0.001$). NRS, however, was similar between the mTLIP and cTLIP groups ($p=0.653$). These results were consistent with those of Abdildin YG et al9 in 2023 and Long G et al10 in 2023, where the authors reported similar outcomes to the current study on the necessity for boluses of rescue analgesics NRS following spine procedures.

According to the study's findings, neither the mTLIP nor the cTLIP groups' participants reported experiencing any PONV during the first 24 hours; however, 61.8% (n=42) of group C participants did, with a p-value of 0.001. PONV scores of 1, 2, and 3 were reported in 18, 22, and 2 of these group C individuals, respectively. Both participants with PONV 3 required the second rescue antiemetic, while those with a PONV score of two required the first.

Constipation, respiratory depression, and/or pruritus were not reported by any participant as opioid-related adverse effects. These findings were consistent with those of Chen K et al. (12) in 2019 and Kumar A et al. (11), whose findings for PONV following lumbar spine surgery were similar to those of the current investigation.

CONCLUSION

The present study, within its limitations, concludes that the analgesic efficacy of the modified TLIP block was not superior when compared to conventional TLIP block. Both techniques have resulted in the same intraoperative and postoperative analgesia for lumbar disc surgeries. However, the study had a few limitations smaller sample size, shorter monitoring period, and single-institution nature. Hence, further longitudinal studies with larger sample sizes and longer monitoring are needed to reach a definitive conclusion.

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Parameters	**Group mTLIP (n=66)**	**Group cTLIP (n=66)**	**Group C (n=68)**
Mean age (years)	42.62±12.02	41.01±11.69	40.91±12.21
Gender			
Males	38	34	30
Females	28	32	38
Weight (kg)	63.77±06.59	64.86±08.47	65.60±10.33
BMI	23.59±02.10	24.16±02.77	23.79±02.92
ASA			
I	42	46	54
II	24	20	14

Table 1: Comparison of demographic data in three groups of study subjects

Parameters	**Group cTLIP (n=66)**	**Group mTLIP (n=66)**	**Group C (n=68)**	**p-value**
Surgery duration (min)	101.30±18.29	101.34±25.70	116.95±24.63	**0.009**
Anesthesia duration (min)	123.04±20.65	141.59±30.05	158.07±27.19	**0.001**
Intraoperative fentanyl consumption (µg)	268.1±57.6	103±22.6	99.53±12.6	**0.001**
NRS on PACU arrival	8	6	5	**0.001**
Time to first analgesic (min)	0	55	135	**0.001**
Total postoperative fentanyl consumption (µg)	957.1±205	404±252.5	387.4±164	**0.001**
Total perioperative fentanyl consumption (µg)	1225.2±237	507.3±258.3	491.4±165.1	**0.001**
PONV incidence (Yes/No)	42/26	66/0	66/0	**0.001**
Need of bolus for postoperative rescue analgesics (Yes/No)	68/0	10/56	10/56	**0.001**
Number of boluses needed				**0.001**
0	0	56	56	
1	2	8	10	

2	6	2	0	
3	26	0	0	
4	28	0	0	
5	4	0	0	
6	2	0	0	

Table 2: Comparison of intraoperative and postoperative parameters in study subjects